

WHAT IS CLAIMED IS:

1. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

5 a first elongate gear rack aligned along the displacement path, said first elongate gear rack having a first end and a second end;

10 a first elongate guide member formed as a single unit with said first elongate gear rack and extending along the displacement path substantially between the first and second ends of said first elongate gear rack;

a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member;

15 a second elongate gear rack aligned along the displacement path and positioned in spaced-apart relation to said first elongate gear rack, said second elongate gear rack having a first end and a second end;

20 a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;

25 a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack; and

pinion drive apparatus operatively associated with said first and second drive pinions, said pinion drive apparatus rotating said first and second drive pinions to move the cartridge access device between the first and second ends of said first and second elongate gear racks.

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2. The translation apparatus of claim 1, wherein said first elongate guide member comprises first and

second opposed bearing surfaces and wherein said first bearing mounted to the cartridge access device slidably 5 engages the first and second opposed bearing surfaces of said first elongate guide member.

3. The translation apparatus of claim 2, wherein said second elongate gear rack includes a second elongate guide member that extends along the displacement path substantially between the first and second ends of said 5 second elongate gear rack and wherein said translation apparatus further comprises a second bearing mounted to the cartridge access device, said second bearing engaging said second elongate guide member.

4. The translation apparatus of claim 3, wherein said second elongate guide member comprises first and second opposed bearing surfaces and wherein said second bearing mounted to the cartridge access device slidably 5 engages the first and second opposed bearing surfaces of said second elongate guide member.

5. The translation apparatus of claim 4, further comprising a third bearing mounted to the cartridge access device, said third bearing contacting said first elongate gear rack and allowing the cartridge access device to move 5 along the displacement path.

6. The translation apparatus of claim 5, wherein said third bearing comprises a wheel.

7. Translation apparatus for moving a cartridge access device along a displacement path, further comprising:

a first elongate gear rack aligned along the

5 displacement path, said first elongate gear rack having a first end and a second end;

10 a second elongate gear rack aligned along the displacement path and positioned in spaced-apart relation to said first elongate gear rack, said second elongate gear rack having a first end and a second end;

15 a third elongate gear rack positioned in generally parallel, spaced-apart relation to said first elongate gear rack;

20 a fourth elongate gear rack positioned in generally parallel, spaced-apart relation to said second elongate gear rack so that said first, second, third, and fourth elongate gear racks define a generally rectangular, parallelopiped configuration with said first and third elongate gear racks defining a bottom side of the generally rectangular, parallelopiped configuration and said second and fourth elongate gear racks defining a top side of the generally rectangular, parallelopiped configuration;

25 a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;

30 a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack; and

35 pinion drive apparatus operatively associated with said first and second drive pinions, said pinion drive apparatus rotating said first and second drive pinions to move the cartridge access device between the first and second ends of said first and second elongate gear racks.

8. The translation apparatus of claim 7, further

comprising:

5           a third drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said third drive pinion engaging said third elongate gear rack; and

10          a fourth drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said fourth drive pinion engaging said fourth elongate gear rack.

9. The translation apparatus of claim 8, further comprising:

5           a fifth elongate gear rack having a first end and a second end, the first end of said fifth elongate gear rack being mounted adjacent the second end of said first elongate gear rack so that said fifth elongate gear rack is aligned along the displacement path; and

10          a sixth elongate gear rack having a first end and a second end, the first end of said sixth elongate gear rack being mounted adjacent the second end of said second elongate gear rack so that said sixth elongate gear rack is aligned along the displacement path.

10. The translation apparatus of claim 9, further comprising:

5           a seventh elongate gear rack having a first end and a second end, the first end of said seventh elongate gear rack being mounted adjacent the second end of said third elongate gear rack so that said seventh elongate gear rack is aligned along the displacement path; and

an eighth elongate gear rack having a first end

10 and a second end, the first end of said eighth elongate gear rack being mounted adjacent the second end of said fourth elongate gear rack so that said eighth elongate gear rack is aligned along the displacement path.

11. The translation apparatus of claim 1, wherein said pinion drive apparatus comprises:

5 a motor having a shaft;  
a worm attached to the shaft of said motor; and  
a worm gear operatively connected to said first and second drive pinions, said worm gear mounted to engage said worm mounted to the shaft of said motor.

12. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

5 a first elongate gear rack aligned along said displacement path, said first elongate gear rack having a first end and a second end;

a first elongate guide member formed as a single unit with said first elongate gear rack so that said first elongate guide member extends along the displacement path;

10 a second elongate guide member extending along the displacement path and positioned in spaced-apart relation to said first elongate guide member;

15 a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;

a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member;

20 a second bearing mounted to the cartridge access device, said second bearing engaging said second

elongate guide member; and  
pinion drive apparatus operatively associated  
with said first drive pinion, said pinion drive  
apparatus rotating said first drive pinion to move  
25 the cartridge access device along the displacement  
path.

13. The translation apparatus of claim 12, further comprising:

5 a second elongate gear rack aligned along said displacement path and positioned in spaced-apart relation to said first elongate gear rack; and

a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack.

14. The translation apparatus of claim 13, wherein said second elongate guide member comprises an integral portion of said second elongate gear rack.

5 15. The translation apparatus of claim 13, wherein said first elongate guide member comprises first and second opposed bearing surfaces and wherein said first bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said first elongate guide member.

5 16. The translation apparatus of claim 15, wherein said second elongate guide member comprises first and second opposed bearing surfaces and wherein said second bearing mounted to the cartridge access device slidably engages the first and second opposed bearing surfaces of said second elongate guide member.

17. The translation apparatus of claim 16, further comprising a third bearing mounted to the cartridge access device, said third bearing contacting said first elongate gear rack and allowing the cartridge access device to move 5 along the displacement path.

18. The translation apparatus of claim 17, wherein said third bearing comprises a wheel.

19. The translation apparatus of claim 17, further comprising:

a third elongate gear rack positioned in generally parallel, spaced-apart relation to said 5 first elongate gear rack; and

a fourth elongate gear rack positioned in generally parallel, spaced-apart relation to said second elongate gear rack so that said first, second, third, and fourth elongate gear racks define a generally rectangular, parallelopiped configuration 10 with said first and third elongate gear racks defining a bottom side of the generally rectangular, parallelopiped configuration and said second and fourth elongate gear racks defining a top side of the generally rectangular, parallelopiped configuration. 15

20. The translation apparatus of claim 19, further comprising:

a third drive pinion mounted to the cartridge access device and operatively associated with said 5 pinion drive apparatus, said third drive pinion engaging said third elongate gear rack; and

a fourth drive pinion mounted to the cartridge access device and operatively associated with said pinion drive apparatus, said fourth drive pinion

10 engaging said fourth elongate gear rack.

21. The translation apparatus of claim 20, further comprising:

5 a fifth elongate gear rack having a first end and a second end, the first end of said fifth elongate gear rack being mounted adjacent the second end of said first elongate gear rack so that said fifth elongate gear rack is aligned along the displacement path; and

10 a sixth elongate gear rack having a first end and a second end, the first end of said sixth elongate gear rack being mounted adjacent the second end of said second elongate gear rack so that said sixth elongate gear rack is aligned along the displacement path.

22. The translation apparatus of claim 21, further comprising:

5 a seventh elongate gear rack having a first end and a second end, the first end of said seventh elongate gear rack being mounted adjacent the second end of said third elongate gear rack so that said seventh elongate gear rack is aligned along the displacement path; and

10 an eighth elongate gear rack having a first end and a second end, the first end of said eighth elongate gear rack being mounted adjacent the second end of said fourth elongate gear rack so that said eighth elongate gear rack is aligned along the displacement path.

23. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

an elongate gear rack aligned along the displacement path;

5           guide means formed as a single unit with said elongate gear rack for guiding the cartridge access device along the displacement path;

10          a drive pinion mounted to the cartridge access device, said drive pinion engaging said elongate gear rack; and

pinion drive means operatively associated with said drive pinion for rotating said first drive pinion to move the cartridge access device along the displacement path.

24. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

5           a first elongate gear rack aligned along the displacement path, said first elongate gear rack having a first end and a second end, said first elongate gear rack also defining a first elongate guide member so that said first elongate guide member also extends along the displacement path substantially between the first and second ends of 10         said first elongate gear rack;

a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member;

15          a second elongate gear rack aligned along the displacement path and positioned in spaced-apart relation to said first elongate gear rack, said second elongate gear rack having a first end and a second end;

20          a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;

a second drive pinion mounted to the cartridge access device, said second drive pinion engaging said second elongate gear rack; and

25           pinion drive apparatus operatively associated with said first and second drive pinions, said pinion drive apparatus rotating said first and second drive pinions to move the cartridge access device between the first and second ends of said first and second  
30           elongate gear racks.

25. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

5           a first elongate gear rack aligned along said displacement path, said first elongate gear rack having a first end and a second end, said first elongate gear rack defining a first elongate guide member that extends along the displacement path;

10           a second elongate guide member extending along the displacement path and positioned in spaced-apart relation to said first elongate guide member;

          a first drive pinion mounted to the cartridge access device, said first drive pinion engaging said first elongate gear rack;

15           a first bearing mounted to the cartridge access device, said first bearing engaging said first elongate guide member;

          a second bearing mounted to the cartridge access device, said second bearing engaging said second elongate guide member; and

20           pinion drive apparatus operatively associated with said first drive pinion, said pinion drive apparatus rotating said first drive pinion to move the cartridge access device along the displacement path.

26. Translation apparatus for moving a cartridge access device along a displacement path, comprising:

5           guide means for guiding the cartridge access device along the displacement path, said guide means also defining an integral elongate gear rack;

          a drive pinion mounted to the cartridge access device, said drive pinion engaging the elongate gear rack defined by said guide means; and

10           pinion drive means operatively associated with said drive pinion for rotating said first drive pinion to move the cartridge access device along the displacement path.